



SITA

**ATC Com Upgrades –
designing to satisfy airline
business case for avionics**

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SITA – if you have not heard

- SITA was set up by the airlines in 1949 to deploy a global data “internet” providing cross border service long before telecom deregulation.
 - SITA “club” now includes over 500 airlines including US airlines that fly internationally. Core is still terrestrial data com for passenger reservations & airline operations.
 - SITA name is French acronym for “International Aeronautical Telecommunications Organization”
- AIRCOM VHF was added around 1980 when aircraft started getting data link. AIRCOM satellite using Inmarsat was added in 1990.
 - Airlines have long used SITA ground network to exchange flight plans, Notam’s, weather with ATC. Aircraft now use SITA AIRCOM for ATC data link applications which is how we got into the “CNS business”.

Aircraft Com Upgrade Hurdles

- **Aircraft communications system upgrades generally only generate benefits when equipage is widespread.**
 - Air Traffic Control has traditionally defined new air-ground communication systems at ICAO/RTCA then mandated avionics installation by airlines.
 - Airlines today will not accept mandates to spend money on new avionics unless the system was designed to be cost effective.
- **FAA has experienced this constraint recently with VDL Mode 3.**
 - How must new systems be designed to get over this hurdle of airlines accepting to invest in avionics ?

ATC System Definition Process

- **FAA or Eurocontrol can get ICAO panels to include their new communications systems in ICAO Annex 10 but that will not guarantee airline adoption.**
 - ICAO panels get some input on technical issues via IATA from airlines, but rarely do any cost/benefit analysis including avionics cost predictions.
 - ICAO adoption of a standard for a new system will not hold much weight with an airline CFO who controls the budget for avionics investment.
 - Aircraft com systems have a much better chance of adoption by airlines if they build on what is already in the aircraft and minimize the upgrade cost.

VDL Mode 3 Example

- **FAA launched VDL3 to offer digitized voice as an alternative to further VHF analog channel split.**
 - Challenge is that for a controller to use a new voice system all the aircraft in the sector would need to be equipped.
- **VDL3 was based on an advanced technical concept but that did not help implementation.**
 - FAA got the ICAO standard adopted in mid 1990's so design was frozen before big contracts were given to industry to build prototype avionics & ground systems.
 - VDL3 might have been more successful if avionics vendors had been allowed to help design the new system.
 - Aircraft installing VDL3 would not have obtained immediate savings and the case for digitized voice will never be easy.
 - This means avionics upgrade will have to be cheap.

ADS-Broadcast example

- ADS-B is rightly seen as one of the pillars of future CNS and it could use VDL Mode 4 but that system has not progressed because it tries to do too much
 - VDL4 is designed to support surveillance & communication which on air transport aircraft are provided by separate boxes so it does not fit into the avionics architecture.
 - VDL4 would probably require installation of a different box instead of upgrades to existing systems.
- ICAO ANS said ADS-B should use Mode S squitter because it builds on existing aircraft capability:
 - Mode-S transponder is already designed for critical surveillance applications so it is much better placed than a VHF radio to handle ADS-B.

Alternative to ATC dedicated links

- Aircraft data links currently used for ATC com are shared with other applications:
 - FANS-1/A ADS/CPDLC is in over 1000 aircraft sharing with airline applications the ACARS data link service which itself shares Inmarsat AMSS links with passenger com.
 - FANS-1/A may not be perfect but it can revolutionize ATC in oceanic/remote airspace if its capability is fully exploited.
 - ICAO VDL Mode 2 was designed for ATN CPDLC but using the same architecture as VHF ACARS so airlines could understand the value it would deliver.
 - SITA has sold VDL ground stations to the ATC's of Germany, Spain and Brazil, combined with partnerships to use them to provide AOC service to SITA airline customers.

ATC use of Satellite Com

- Airlines have installed avionics using Inmarsat AMSS in over 2000 aircraft. Biz jet equipage numbers are even higher & USAF is equipping around 700.
 - AMSS dat service is low speed but that is not a constraint for very short FANS-1A ADS/CPDLC messages.
 - Key focus now is on upgrading Inmarsat ground stations to improve reliability and handle increasing aircraft numbers.
 - Japan CAB has launched MTSAT and selected SITA to implement aircraft communications service for airlines.
- ATC future needs for higher capacity ?
 - NASA & Eurocontrol are evaluating Inmarsat Swift services, which will provide 432 kbps over dedicated links.
 - ATC must resist temptation to redesign Swift and undermine the benefits of using generic mobile terminals.

ATN lessons for air-ground IP

- **ATC sharing of links with airline applications is a good idea but where should the sharing start ?**
 - ATN stated objective was to use telecom industry standard protocol and to support ATC/AOC and even AAC/APC
 - ATN turned out to be unnecessarily complicated so ACARS directly uses VDL/Satcom and passenger data com is using IP over satcom leaving just ATC using the ATN protocol.
 - ATC staff working on ATN protocol cannot be blamed for the success of IP but those looking to base communications on IP should see the dangers of customizing generic protocols.
 - ATC standards for use of IP should focus on establishing a secure tunnel through any available TCP/IP connection rather than customizing IP addressing/routing schemes.

ATC com systems credibility

- **ATC com system upgrade success requires coordinated approach to CNS domain.**
 - **FAA Global CNS System (GCNSS) does not seem to recognize some of its “new” com functions are already used by FAA Oceanic FANS system.**
 - **Aircraft certification needs to be aware when approval of submitted avionics is key to ATC agency modernization plans.**
 - **Data link projects should all recognize that in air transport up to 2015 only ATC com option will be VDL2 and only ADS-B option will be Mode S ES.**

FAA/NASA/Eurocontrol Study

- **ATC community has stop designing regional systems but can it design a global system now that stands a chance of still being relevant in 2020 ?**
 - How to define a 2020 system when the telecom industry is developing a new mobile service every few years and these will soon become available even in aircraft cabins ?
- **ITU 2007 conference and competition for ex-MLS band is a major motivation to agree a future system**
 - Aircraft use of 802.11 is unlikely to work so can aviation agree to use the ex-MLS band for a next generation MAN.
 - Transition within the VHF band to a future system would have a high probability of failure and plans to use VHF undermine aviation claim to need the 5GHz spectrum.

Conclusion

- **Aircraft data communications systems that have been successful were all designed by industry.**
 - ATC has begun implementation of data link using the ACARS system and the Inmarsat satellites.
 - VDL3 ended up being much too hard compared to “simple” split of VHF analog channels to 8.33 kHz.
- **Aircraft communications systems are becoming ever more complex and support many applications.**
 - ATC community must decide in this age of outsourcing if should really go on designing aircraft com links.
 - Could ATC just define performance/capacity needs, leaving industry to develop the required communications links and convince the airlines to install the necessary avionics?